

What is claimed is:

1. A lightweight, ballistic resistant panel for limiting the penetration of an incoming projectile, comprising:
- at least one first layer¹¹ formed of a woven ballistic resistant material;
 - at least one second layer¹² formed of a non-woven ballistic resistant material;
 - a first series of connectors⁴² intermittently joining said at least one first layer and said at least one second layer; and
 - a second series of connectors⁴⁴ intermittently joining said at least one first layer and said at least one second layer;
- wherein the first and second series of connectors define unconnected areas⁴⁶ of material having a cumulative surface area substantially larger than the cumulative surface area of the connected material.
2. The ballistic panel of claim 1 wherein the at least one first layer formed of a woven ballistic resistant material is formed of Kevlar.
3. The ballistic panel of claim 1 wherein the at least one second layer formed of a non-woven ballistic resistant material is formed of Spectra Shield.
4. The ballistic panel of claim 3 wherein the at least one layer formed of a Spectra Shield material is formed of Spectra Shield LCR 90° x 90°.
5. The ballistic panel of claim 3 wherein the at least one layer formed of a Spectra Shield material is formed of Spectra Shield LCR 45° x 45°.
6. The ballistic panel of claim 1, comprising:
- an initial layer of woven ballistic resistant material having a front surface facing the potential projectile and an opposing back surface;

five layers formed of non-woven ballistic resistant material adjacent to said opposing back surface of said initial layer;

a seventh layer formed of a woven ballistic resistant material adjacent to said five layers;

an additional five layers of non-woven ballistic resistant material adjacent to said seventh layer; and

a thirteenth layer formed of a woven ballistic resistant material adjacent to said additional five layers.

7. The ballistic panel of claim 1, comprising:

an initial layer formed of woven Kevlar having a front surface facing the potential projectile and opposing back surface;

three layers formed of thermoset Kevlar adjacent to said opposing back surface of said initial layer;

eight layers formed of Spectra Shield adjacent to said three layers of thermoset Kevlar; and

three additional layers formed of thermoset Kevlar adjacent to the eight layers formed of Spectra Shield.

8. The ballistic panel of claim 1 further comprising a protective sheath.

9. The ballistic panel of claim 1 wherein said first series of connectors and said second series of connectors are formed of materials selected from a group consisting of aramid polymers, polyolefins, polyethylene and high molecular weight polypropylene.

10. The ballistic panel of claim 1 wherein said first series of connectors and said second series of connectors comprise a filament of cotton.

11. The ballistic panel of claim 1 wherein the panel includes a plurality of said first layer and a plurality of said second layer; in a ratio of at least three of said second layer to each one of said first layer.

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12. The ballistic panel of claim 1 wherein the first and second series of connectors form a quilted pattern defining bounded squares of unconnected material.
13. The ballistic panel of claim 1 further comprising connectors to join the perimeter of the layers.
14. A composite ballistic panel, comprising:
a first ballistic panel, comprising:
at least one first layer formed of a woven ballistic resistant material;
at least one second layer formed of a non-woven ballistic resistant material;
a first series of connectors intermittently joining said at least one first layer and said at least one second layer; and
a second series of connectors intermittently joining said at least one first layer and said at least one second layer;
wherein the first and second series of connectors define unconnected areas of material having a cumulative surface area substantially larger than the cumulative surface area of the connected material; and
a second ballistic panel, comprising:
at least one first layer formed of a woven ballistic resistant material;
at least one second layer formed of a non-woven ballistic resistant material;
a first series of connectors intermittently joining said at least one first layer and said at least one second layer; and
a second series of connectors intermittently joining said at least one first layer and said at least one second layer;
wherein the first and second series of connectors define unconnected areas of material having a cumulative surface area substantially larger than the cumulative surface area of the connected material.
15. The composite ballistic panel of claim 14, further comprising:
a hard coupon, comprising:

a first layer formed of a ballistic resistant material; and
a second layer formed of a ballistic resistant material;
wherein said first layer and said second layers are joined together via a laminate.

16. The composite ballistic panel of claim 14 further comprising a protective sheath.
17. A lightweight, moldable ballistic panel for limiting the penetration of objects, comprising:
an initial projectile deformation layer formed of a pliable metallic material; and
at least two layers formed of a woven ballistic resistant material positioned adjacent to the
projectile deformation layer.
18. The ballistic panel of claim 17 wherein said initial projectile deformation layer is formed
of a titanium sheet.
19. The ballistic panel of claim 18 wherein the titanium sheet is less than about 0.2 inches in
thickness.
20. The ballistic panel of claim 17 wherein said at least two layers of a woven ballistic
resistant material comprises at least 16 layers.
21. The ballistic panel of claim 20 wherein said at least two layers of a woven ballistic
resistant material comprises at least 32 layers.
22. The ballistic panel of claim 17 wherein the weight of the panel is less than 6 pounds per
square foot.
23. The ballistic panel of claim 17 further including a protective sheath surrounding said at
least two layers, said protective sheath disposed between said initial projectile deformation
layers and said at least two layers.

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24. A ballistically modified cover for a seat, comprising:
a seat back rest portion comprising at least one layer formed of a woven ballistic resistant material and at least one layer formed of a non-woven ballistic resistant material; and
attachment straps for securing the seat back rest portion to the seat.
25. The ballistically modified cover of claim 24 wherein the seat back rest portion comprises:
an initial layer formed of Kevlar 29;
three layers formed of thermoset Kevlar adjacent to the initial layer of Kevlar 29;
eight layers formed of Spectra Shield adjacent to the three layers of thermoset Kevlar; and
three additional layers formed of thermoset Kevlar adjacent to the eight layers formed of Spectra Shield.
26. The ballistically modified cover of claim 24 further comprising:
a first headrest extension; and
a second headrest extension, each of said first headrest extension and said second headrest extension extending from the seat back rest portion and formed of the same material as the seat back portion.
27. A method for making a lightweight ballistic panel, comprising the steps of:
aligning at least one layer formed of a woven ballistic resistant material and at least one layer formed of a non-woven ballistic resistant material in a stacked configuration; and
interconnecting a small portion of the layers while leaving a substantially larger portion of the layers unconnected.
28. The method of claim 27 wherein the step of aligning the layers in a stacked configuration, comprises:
providing an initial layer formed of woven ballistic resistant ;
stacking five layers formed of non-woven ballistic resistant material on top of the initial layer;

stacking a seventh layer formed of woven ballistic resistant material on top of the five layers;

stacking five additional layers formed of non-woven ballistic resistant material on top of the seventh layer; and

stacking a thirteenth layer formed of woven ballistic resistant material on top of the five additional layers.

29. The method of claim 27 wherein the step of interconnecting a small portion of the layers, comprises joining the layers together via a filament of Kevlar material.

30. The method of claim 27 wherein the step of interconnecting a small portion of the layers, comprises joining the layers together via a filament of Spectra material.

31. The method of claim 27 wherein the step of interconnecting a small portion of the layers, comprises joining the layers together via a filament of high-strength cotton.

32. The method of claim 27 wherein the step of interconnecting a small portion of the layers comprises interconnecting the layers in a quilting pattern.

33. The method of claim 32 wherein the step of interconnecting a small portion of the layers further comprises interconnecting the perimeter of the layers.

34. The method of claim 27 wherein the step of aligning the layers in a stacked configuration, comprises:

providing an initial layer of woven Kevlar

stacking three initial layers formed of S745 thermoset Kevlar on top of the initial layer of Kevlar;

stacking eight layers formed of non-woven Spectra on top of the three layers of thermoset S745 Kevlar; and

stacking three additional layers formed of S745 thermoset Kevlar on top of the eight layers of Spectra.

35. The method of claim 27 further comprising the step of providing a protective sheath for the ballistic panel.

36. A method for making a lightweight, composite ballistic panel, comprising the steps of:
providing a first ballistic panel, comprising the steps of:

aligning at least one layer formed of a woven ballistic resistant material and at least one layer formed of a non-woven ballistic resistant material in a stacked configuration; and
interconnecting a small portion of the layers while leaving a substantially larger portion of the layers unconnected;

providing a second ballistic panel, comprising the steps of:

aligning at least one layer formed of a woven ballistic resistant material and at least one layer formed of a non-woven ballistic resistant material in a stacked configuration; and
interconnecting a small portion of the layers while leaving a substantially larger portion of the layers unconnected; and

aligning the first and second ballistic panels in a stacked configuration.

37. The method of claim 36 further comprising the step of providing a hard coupon formed of laminated layers of ballistic resistant material and aligning the hard coupon with the first and second ballistic panels in a stacked configuration.

38. A method of aligning ballistic panels to limit the penetration of missiles, comprising the steps of:

providing a first ballistic panel with a quilted interconnection pattern;

providing a second ballistic panel with a quilted interconnection pattern offset from the quilted interconnection pattern of the first ballistic panel;

providing a third ballistic panel with a quilted interconnection pattern in alignment with the quilted interconnection pattern of the first ballistic panel; and

aligning the ballistic panels in a stacked configuration.

39. The method of claim 38 further comprising the step of providing a hard coupon formed of laminated layers of ballistic resistant material and aligning the hard coupon with the first, second, and third ballistic panels in a stacked configuration.

40. A method for making a lightweight ballistic panel, comprising the steps of:
providing an initial layer formed of a pliable metallic material;
aligning at least two layers formed of a ballistic resistant material with the initial layer in a stacked configuration; and
bonding the at least two layers to the metallic material.

41. The method of claim 40 wherein the step of providing at least two layers comprises providing 16 layers of S745 thermoset Kevlar.

42. The method of claim 40 wherein the step of providing at least two layers comprises providing 32 layers of S745 thermoset Kevlar.

43. An ultra lightweight ballistic resistant material, comprising:
a panel of ballistic resistant material capable of stopping penetration of a NATO round of 7.6 millimeters impacting at a velocity of 838 meters per second, said panel weighing less than 3.0 pounds per square foot.

44. The material of claim 43, wherein said panel weighs less than 2.5 pounds per square foot.

45. The material of claim 44, wherein said panel weighs less than 2.0 pounds per square foot.

46. The material of claim 45, wherein said panel weighs less than 1.5 pounds per square foot.

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Attorney Docket No. 31183.6

Customer No. 000027683

47. The material of claim 43, wherein said panel comprises at least one layer of woven ballistic resistant material and at least one layer of non-woven ballistic resistant material.

48. The material of claim 47, further including a member interconnecting said at least one layer of woven ballistic resistant material and at least one layer of non-woven ballistic resistant material.

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